Urinary GCA (Gamma-Carboxyglutamate)

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The function of vitamin K is to serve as a co-factor during the post-translational carboxylation of glutamate (Glu) residues into γ-carboxyglutamate (Gla) residues.

After protein catabolism, Gla residues contained in the vitamin K-dependent proteins are excreted in the urine and have been used as an indicator of vitamin K status. Urinary Gla responds to alterations in dietary intake, but periods of several days are needed before any change can be observed, and significant changes take longer. Increases in vitamin K intake have not been shown to induce significant changes in urinary Gla. Response of urinary Gla to vitamin K intake also appears to be age-specific. Depletion periods result in significant decreases in urinary Gla excretion in younger, but not the older, subjects. There is insufficient data for using urinary Gla excretion for estimating vitamin K intake.

Gamma-carboxyglutamic acid is an amino acid with a dicarboxylic acid side chain. This amino acid, with unique metal binding properties, confers metal binding character to the proteins into which it is incorporated. This amino acid has been discovered in blood coagulation proteins (prothrombin, Factor X, Factor IX, and Factor VII), plasma proteins of unknown function (Protein C, Protein S, and Protein Z), and proteins from calcified tissue (osteocalcin and bone-Gla protein). It has also been observed in renal calculi, atherosclerotic plaque, and the egg chorioallantoic membrane, among other tissues. Gamma-carboxyglutamic acid is synthesized by the post-translational modification of glutamic acid residues. This reaction, catalyzed by a hepatic carboxylase, requires reduced vitamin K, oxygen, and carbon dioxide. (Burnier, Borowski et al. 1981)

References

Burnier, J. P., M. Borowski, et al. (1981). "Gamma-carboxyglutamic acid." Mol Cell Biochem **39**: 191-207.